Purpose

The purpose of this policy is to define the Utah Department of Transportation's (UDOT's) policy regarding Highway Linear Referencing. It establishes guidelines when referencing locations or exchanging data for all classes of roads within the State of Utah.

Policy

In order to facilitate the correlation of highway reference data there will be a Highway Linear Referencing System (HLRS). This Highway Linear Referencing System supports multiple, approved referencing methods. Each supported method will be approved by the Engineering Information Systems Team (EIST) on the recommendation of the Highway Reference Task Force (HRTF). The approved methods are intended to facilitate location referencing for urban and rural roads in Utah.

Background

In the past the highways were referenced through the use of mileposts. The numbers on the posts were intended to be the exact mileage or accumulated distance from the beginning of the route to that particular post. Changes in highway alignment, length, ownership, or nomenclature caused posts to be moved or required equations to be used to compensate for the impact of those changes. Movement of posts or usage of equations created confusion since the post numbers no longer represented the true accumulated mileage.

The Highway Reference Task Force was created to develop standards for linear referencing which would eliminate the confusion caused by the milepost system. The Highway Reference Task Force may adopt a preferred location reference method that is different in rural areas than in urban areas or that is different on Federal-Aid Eligible (FAE) roads than on non-FAE roads.

Definitions

Accumulative Distance
The accumulative distance is the distance in miles or kilometers from the beginning of a route to some point on that route or roadway. Accumulative mileage (accum. miles) would be the distance in miles from the beginning of a route to some point on that route or roadway. Accumulative kilometers (accum. km.) would be the distance in kilometers from the beginning of a route to some point on that route or roadway.

Accumulated kilometers
See Accumulated Distance.

Accumulated Miles
See Accumulated Distance.

Address
An address is a sequence of numbers and characters used to represent the location of a point on a roadway or route.

Bidirectional (B)
Bidirectional is a route attribute and is designated as a B. Bidirectional refers to a road that is usually not physically split or divided, thus the length of the road is the same when traveled in either direction. Some routes may be physically divided over a minor portion of their length but they may still be treated as bidirectional for purposes of location referencing.

Direction
Direction is a route attribute and is designated as P for the positive direction (generally South to North or West to East) and N for the negative direction (generally North to South or East to West). The positive direction (P) is the direction of travel where the accumulated distance increases. The negative direction (N) is the direction of travel where the accumulated distance decreases. Direction can also be designated as B for bidirectional -- see Bidirectional (B).

Distance Increments\Decrements
Accumulated distances increase or decrease relative to the route's positive direction. When traveling in the positive direction, the accumulated distance increases and when traveling in the negative direction, the accumulated distance decreases.

Divided Routes
Divided routes are routes which have been designated as two logical entities for purposes of data identification or collection. Examples of routes defined as divided routes are interstates and expressways (such as I-15, I-70, I-80, I-84, I-215).

Highway Location Reference Method
The primary objective of any highway location reference method is to provide a means for designating and recording the geographic positions of specific locations on a highway and for using the designations as a key to stored information about the locations. A method must be simple because it is used by personnel at various levels of technical competence. Three elements common to all location reference methods are (a) identification of a known point, (b) a measurement from the known point, and (c) a direction of measurement. A highway linear reference method is a set of procedures used in the field to identify the location of any point. Examples are Reference Post and Offset, Accumulated Distance, and Street Address.

Highway Location Reference System
A highway location reference *system* is a set of office and field procedures that includes one or more highway location reference *methods*. The method is a way to identify a specific location with respect to a known point. The system is seen as the procedures that relate all locations to each other and includes techniques for storing, maintaining, and retrieving location information.

Highway Reference Task Force
The group of individuals, as authorized and appointed by the Engineering Information Systems Team, that sets parameters for the highway reference system and recommends the types and number of reference methods to support.

Interchanges|Intersections
Linking points that connect and interconnect individual streets and highway segments of the system. Interchanges are considered to be associated with the higher functional route (interstate would be higher than arterial, etc.). For interchange ramp identification, see Ramp Nomenclature.

Milepoint
Milepoint is an obsolete term that was intended to represent Accumulated Mileage. See Accumulated Distance.

Negative Direction (N)
The negative direction (N) is the direction of travel where the accumulated distance decreases.

Offset
See Reference Post and Offset.

Positive Direction (P)
The positive direction (P) is the direction of travel where the accumulated distance increases.

Ramp
A ramp is a means to exit or enter a highway. The ramp begins at the physical split from the highway (at the point the right or left lane splits from the highway pavement) or the physical joining of the highway (at the point where the right or left lane joins the highway pavement).

Ramp Nomenclature
Interchange ramps are assigned numbers using a counter-clockwise, decreasing spiral (generally from the outside or outer-most ramps to the inside or inner-most ramps) based on the positive direction of the primary route. The primary route is the route with the highest functional classification, or the lowest-numbered route when the routes are of equal functional classification. Where the I-15 and I-70 interchange, the number one ramp would be based on the positive direction (North) of I-15, the primary route, since I-15 and I-70 have equal functional classifications and I-15 is numerically lower than I-70. Where the I-215 and SR-201 interchange, the number one ramp would be based on the primary direction (North) of I-215 since I-215 is a higher classification route than SR-201. To determine the number that has been assigned to a particular ramp at an interchange, refer to the diagram for that interchange on the interchange map.

Reference Post (Ref. Post)
A reference post is a post placed on the road which can be easily identified in the field. These posts are placed on the positive or primary side of the roadway on bidirectional roadways and are placed on both sides of the roadway perpendicular to each other on divided highways.

Reference Post and Offset
Reference Post and Offset is a linear reference method. This method requires four elements of data:

1. **Road identifier or nomenclature** - the road name (Example: 0191).
2. **Reference Post Identifier** - the name of a reference post.
3. **Offset** - distance from the identified reference post to the point being described.
4. **Offset direction indicator** - an indication that the offset from the reference post is to be applied in a positive (+) or negative (-) manner to locate the described point.

Route Length
The route length is the distance measured from the beginning of a route to the end. The measurement shall be taken in the positive direction of travel and may be taken in kilometers or miles.

Route Nomenclature
The route nomenclature is a name which consists of a two-digit or two-character agency identifier and a four-digit route number. All State and Federal-Aid Eligible routes shall have a unique four-digit route number. Zones and other anomalies also have a unique four-digit route number. Route nomenclature allows for all road segments in Utah to be identified by a unique route name for data exchange.

Procedures

General Information UDOT 07-20.1

Responsibility: Highway Reference Task Force (HRTF)

Actions

1. Review highway related referencing problems.
2. Develop solutions to reference problems.
3. Disseminate the solutions throughout UDOT.
4. Secure representation from all areas of UDOT.
5. Develop Policy and Procedure regarding Highway Referencing issues for approval by UDOT.
6. Determine problems with current and future reference methods.
7. Function as a sounding board for individuals with questions about a wide variety of highway inventory and attribute related problems.
8. Ensure the use of the highway linear reference methods adopted by UDOT and external agencies.
9. Conduct training courses, as necessary, for all of UDOT and external agencies.

Responsibility: Engineering Information Systems Team (EIST)

10. Review highway related referencing problems, referring Linear Referencing Problems to the Highway Reference Task Force for review.
11. Disseminate referencing solutions and relationships throughout UDOT.
12. Give direction to the Highway Reference Task Force.
13. Provide liaison to the Highway Reference Task Force.

Responsibility: Data Analysis Section

14. Inventory and calibrate the reference post locations and accumulated distance on all State and Federal-Aid Eligible (FAE) Routes.

15. Develop and maintain a route nomenclature for all routes within the State of Utah for use in data exchange.

16. Determine and publish the official lengths of routes.

17. Maintain a historic comparison of changes to routes; nomenclature, alignment, ownership, distance, etc.

18. Notify all of UDOT of updates or changes to the linear reference system each and every year with a data file available for use by computer systems and through hard copy, e-mail, or other form.

19. Produce an on-line reference manual for State and Federal-Aid Eligible Routes and a hard copy version.

20. Represent the roadway distances in miles and kilometers.

21. Keep ROADSTAT or other computer systems up-to-date with the reference system.

Responsibility: Maintenance

22. Place or replace reference posts exactly where indicated by the Data Analysis Section.

23. Place reference posts on both sides of a divided route, perpendicular to each other regardless of travel direction or accumulative distance.

24. If problems occur or if a post is missing, call the Data Analysis Section.

25. Request training as needed.

Responsibility: Appropriate Jurisdictional Entities

26. Place or replace reference posts exactly where indicated by the Data Analysis Section. The initial signs and posts, and their associated costs, are provided by the State. Installation or replacement of the signs and posts, and their associated costs, is provided by the appropriate jurisdictional entity.

27. If problems occur or if a post is missing, call the Data Analysis Section.

28. Request training as needed.

Responsibility: All UDOT Employees

29. Use the approved highway linear referencing methods in correspondence, business transactions, inventory pursuits, and other activities.

30. Be knowledgeable of the highway linear referencing methods in order to function in one's job.

31. Attend or request training sessions as needed.

32. Update computer systems and documents yearly to incorporate the updates released by the Data Analysis Section.